

2003-1559
67,200-1262

CLAIMS

What is claimed is:

1. A method of preventing electrostatic discharge damage to a photomask, comprising the steps of:

providing a mask substrate;

providing a pattern-forming material on said mask substrate;

providing patterned exposure regions in said pattern-forming material; and

providing at least one ion implantation region in said mask substrate by implanting ions into said mask substrate.

2. The method of claim 1 wherein said mask substrate is quartz or calcium fluoride.

3. The method of claim 1 wherein said pattern-forming material is chromium.

4. The method of claim 1 wherein said at least one ion implantation region has a positive electrical charge.

5. The method of claim 1 wherein said at least one ion implantation region has a negative electrical charge.

6. The method of claim 1 wherein said ions are present in said at least one ion implantation region at a concentration of about 10^{10} ions/cm².

7. The method of claim 1 wherein said photomask is a binary intensity mask, a half-tone phase-shifting mask or an alternating phase-shifting mask.

8. The method of claim 1 wherein said ions are boron, arsenic, phosphorous, aluminum or gallium ions.

9. A method of preventing electrostatic discharge damage to a photomask, comprising the steps of:

providing a mask substrate;

providing at least one ion implantation region in said mask substrate by implanting ions into said mask substrate;

providing a pattern-forming material on said mask substrate; and

providing patterned exposure regions in said pattern-forming material.

10. The method of claim 9 wherein said mask substrate is quartz or calcium fluoride.

11. The method of claim 9 wherein said pattern-forming material is chromium.

12. The method of claim 9 wherein said at least one ion implantation region has a positive electrical charge.

13. The method of claim 9 wherein said at least one ion implantation region has a negative electrical charge.

14. The method of claim 9 wherein said ions are present in said at least one ion implantation region at a concentration of about 10^{10} ions/cm².

15. The method of claim 9 wherein said photomask is a binary intensity mask, a half-tone phase-shifting mask or an alternating phase-shifting mask.

16. The method of claim 9 wherein said ions are boron, arsenic, phosphorous, aluminum or gallium ions.

17. An electrostatic discharge-resistant photomask comprising:

a mask substrate;

a pattern-forming material having exposure regions provided on said mask substrate; and

at least one ion implantation region having ions implanted into said mask substrate.

18. The photomask of claim 17 wherein said at least one ion implantation region has a positive electrical charge.

19. The photomask of claim 17 wherein said at least one ion implantation region has a negative electrical charge.

20. The photomask of claim 17 wherein said ions are boron, arsenic, phosphorous, aluminum or gallium ions.